Combining PTC and NTC Thermistor Materials in Order to Create Hybrid Materials with Stable Property of Resistance at Any Temperature

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Introduction

In order to understand how it might be possible to create a hybrid molecule which features both the features of a Positive Thermal Co-Efficient Thermistor and a Negative Thermal Co-Efficient Thermistor, one must understand the internal electrical dynamics of both the PTC and NTC effects. PTC effects, for their part, I would posit, rely upon a central channel of electrical conduction in which there is a need for the internal component of the molecule (in lead titanate, the tetrahedral oxygen,) which is encapsulated within a cubic formation of lead, to remain positionally stable within that structure for at least a certain amount of time in order to make electrical conduction likely.

This effect is similar to the dynamics at play in a quartz crystal used for timing purposes. Even quartz crystals, however, will conduct electricity at intervals which vary with temperature. Whereas our purpose is to overcome the tendency of resistance to vary with temperature, we must then create a molecule which features the internal behavior of lead titanate but also features the motility of NTC materials such as silver sulfide which conduct more readily at increased temperatures due to their own tendency to conduct around the periphery of molecules rather than forcing current to pass through the center of a molecule as in PTC materials.

Abstract

Although it would require a perfected harmony between the two materials, a bespoke meta-material featuring both PTC and NTC Thermistor elements could be made to conduct electricity in a manner which is consistent regardless of temperature (MRI machines, for example, have both extremely hot and extremely cold components which are electrically functional) and this could increase the usage parameters of systems requiring this unique capability, perhaps reducing the cost associated with manufacture.

In the space domain, for example, orbital platforms undergo extreme oscillations in temperature when platforms pass from the “day” side to the “night” side of the planet and also experience sheer temperature gradients between the hot and cold sides of components themselves as there is always a Sun-facing and Sun-opposing side. More predictable delivery of current could extend the lifespan of electronics in this context.

The best implementation of such a system, to wit, would be to create a hybrid conductive wire consisting of a series of two-dimensional sheets, half of which are made of a PTC material and half of which are made of an NTC material. The sheets would separately convey current, with conduction being enhanced, necessarily, in half of the layers and diminished in the other half when there is a temperature fluctuation; positive or negative.

Conclusion

This basic concept may be expounded upon and modified in order to create conductive systems with fine-tuned properties bespoke to the application. The application of localized magnetic fields which are unique to each layer could allow for absolute consistency of electrical delivery even when the NTC and PTC co-efficients do not necessary complement one-another precisely at every single point on a temperature curve. Because solid-state magnets experience diminished efficacy at both extreme high and extreme low temperatures, they would make logical tools for fine-tuning hybrid NTC/PTC layered conductive mechanisms of the type proposed.